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1. A metadata model transformer for transforming a metadata model, the metadata model having a lower layer containing one or more lower abstraction model objects having a lower abstraction level and a higher layer containing one or more higher abstraction model objects having a higher abstraction level, the transformer comprising:
- a lower-to-higher transformation having:
- means for obtaining information of a lower abstraction model object from the lower layer;
- means for abstracting the information by adding business intelligence; and
- means for creating in the higher layer a higher abstraction model object corresponding to the lower abstraction model object.
2. A metadata model transformer as claimed in claim 1 further comprising:
- a lower layer transformation having:
- means for obtaining information of a lower abstraction model object from the lower layer;
- means for modifying the obtained information; and
- means for transforming the lower abstraction model object based on the modified information.
3. A metadata model transformer as claimed in claim 1 further comprising:
- a lower layer transformation having:
- means for obtaining information of a lower abstraction model objects from the lower layer;
- means for determining a specific feature included in the obtained information; and
- means for creating a new lower abstraction model object based on the specific feature.
4. A metadata model transformer as claimed in claim 1 further comprising:
- a lower layer transformation having:
- means for obtaining relationship information between multiple lower abstraction model objects from the lower layer; and
- means for creating a new lower abstraction model object based on the relationship information.

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5. A metadata model transformer as claimed in claim 1 further comprising:
a higher layer transformation having:
means for obtaining information of a higher abstraction model object from
the higher layer;
means for modifying the obtained information; and
means for transforming the higher abstraction model object based on the
modified information.
6. A metadata model transformer as claimed in claim 1 further comprising:
a higher layer transformation having:
means for obtaining information of a higher abstraction model objects from
the higher layer;
means for determining a specific feature included in the obtained
information; and
means for creating a new higher abstraction model object based on the
specific feature.
7. A metadata model transformer as claimed in claim 1 further comprising:
a higher layer transformation having:
means for obtaining relationship information between multiple higher
abstraction model objects from the higher layer; and
means for creating a new higher abstraction model object based on the
relationship information.
8. A metadata model transformer as claimed in claim 1 further comprising:
a higher layer transformation having:
means for selecting a subset of the higher abstraction model objects from
the higher layer; and
means for creating a new higher abstraction model object based on the
selected subset of the higher abstraction model objects.
9. A metadata model transformer for transforming a metadata model that represent
one or more data sources having physical data, the metadata model having a data
access layer containing data access model objects, a business layer containing business
model objects, and a package layer containing package model objects, the transformation

comprising:

one or more data access model transformations for refining description of the physical data in the data source expressed by the data access model objects;

one or more data access to business model transformations for constructing business model objects based on the data access model objects;

one or more business model transformations for refining the business rules expressed by the business model objects; and

one or more business to package model transformations for constructing package model objects based on the business model objects.

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10. A metadata model transformer as claimed in claim 9, wherein the data access model transformations refines the description by adding new data access model objects to data access model objects which are constructed via import from the data sources or one or more metadata sources.

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11. A metadata model transformer as claimed in claim 9, wherein the business model transformations refines the business rules by changing the business model objects.

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12. A metadata model transformer as claimed in claim 11, wherein the business model objects include business model objects which are constructed via import from one or more metadata sources.

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13. A metadata model transformer as claimed in claim 9 further comprising:
one or more package model transformations for constructing a new package layer based on the package model objects in the model.

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14. A metadata model transformer as claimed in claim 13, wherein the package model objects include package model objects which are constructed via import from one or more metadata sources.

15. A metadata model transformer as claimed in claim 9 further comprising:
a name mutation transformation for changing names of objects in the model based on user defined rules.

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16. A metadata model transformer as claimed in claim 9, wherein the data access model transformations include a transformation which creates a new data access model

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object based on the data access model objects contained in the data access layer.

17. A metadata model transformer as claimed in claim 16, wherein
the data sources contain tables having columns and indexes;

5 the data access model objects include data access tables, data access columns
and data access indexes which respectively describe information about the tables,
columns and indexes in the data sources; and

the data access model transformations include a data access join constructing
transformation for constructing a data access join between data access tables based on
10 the data access indexes.

18. A metadata model transformer as claimed in claim 16, wherein
the data sources contain tables having columns and indexes;

15 the data access model objects include data access tables, data access columns
and data access indexes which respectively describe information about the tables,
columns and indexes in the data sources; and

the data access model transformations include a data access key constructing
transformation for creating a data access key for a data access table based on the data
access indexes.

20 19. A metadata model transformer as claimed in claim 16, wherein

the data sources contain at least one of tables having columns and indexes, views
having columns or files having columns or fields;

25 the data access model objects include at least one of data access tables, data
access views, data access files, data access columns and data access indexes which
respectively describe information about the tables, columns of the tables, indexes of the
tables, the views, the columns of the views, the files, and the columns or fields of the files
in the data sources; and the data access model transformations include a table
extract constructing transformation for constructing a table extract based on the data
30 access tables, the data access views and the data access files.

20. A metadata model transformer as claimed in claim 16, wherein

35 the data access model objects include one or more logical cube, each of which
defines a multidimensional space represented in a number of physical storage formats;
and

the data access model transformations include a data access cube constructing

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transformation for constructing data access cubes to instantiate the multidimensional space defined by each logical cube.

21. A metadata model transformer as claimed in claim 9, wherein the data access to
5 business model transformations include a basic business model constructing
transformation which obtains information about a data access model object in the data
access layer, and create a business model object corresponding to the data access
model object.

22. A metadata model transformer as claimed in claim 21, wherein
the business model objects include entities that exist as an implementation artifact
of a many to many relationship, and many to many business joins associated with the
entities; and
the business' model transformations include a many to many join relationship
15 fixing transformation for locating the entities, and replacing the associated many to many
business joins with a single business join.

23. A metadata model transformer as claimed in claim 21, wherein
the business model objects include entities that are related via a 1:1 join
20 relationship; and
the business model transformations include an entity coalescing transformation for
locating the entities that are related via a 1:1 join relationship, and coalescing the located
entities into a single entity.

24. A metadata model transformer as claimed in claim 21,
the business model objects include one or more redundant joins that express the
transitivity of two or more other join relationships in the business layer; and
the business model transformations include a redundant join relationship
eliminating transformation for locating the redundant joins, and eliminating the redundant
30 joins from the business layer.

25. A metadata model transformer as claimed in claim 21, wherein
the business model transformations include a subclass relationship introducing
transformation for introducing a new entity with a subclass relationship into the business
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the business model transformations include an entity referencing transformation for locating the entity acting as a lookup table, and changing the business join which is an association type to a business join which is a reference type.

10 the business model transformations include an attribute usage determining transformation for determines the usage of an attribute based on how it is used by other business model objects.

15 the business model transformations include a date usage identifying transformation for examining attributes to determine where dates are used in the attributes.

20 package model transformations include a basic package model constructing
transformation for constructing a package layer by forming a package with package
model objects which corresponds to a subset of the business model objects.

transformations include a special package construction transformation for constructing a specific package which is usable by a specific client application from a generic package.

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38. A method as claimed in claim 36, wherein the step of refining the business rules comprises a step of changing the business model objects.

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